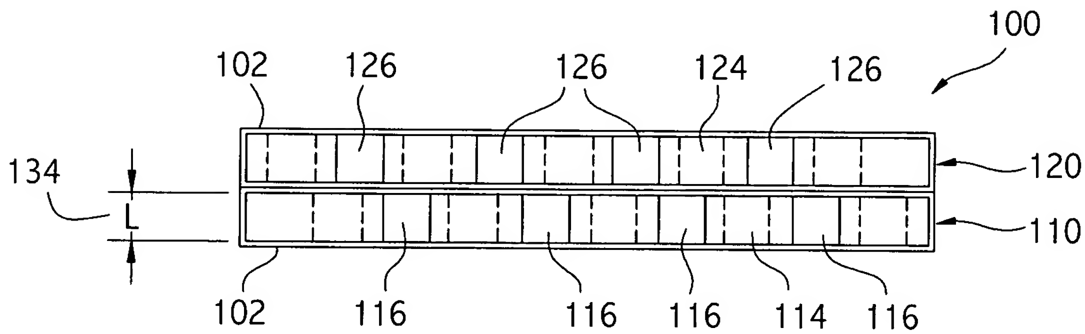

100
102
126
126
124
126
134
L
120
110
102
116
116
116
114
116

FIG. 1

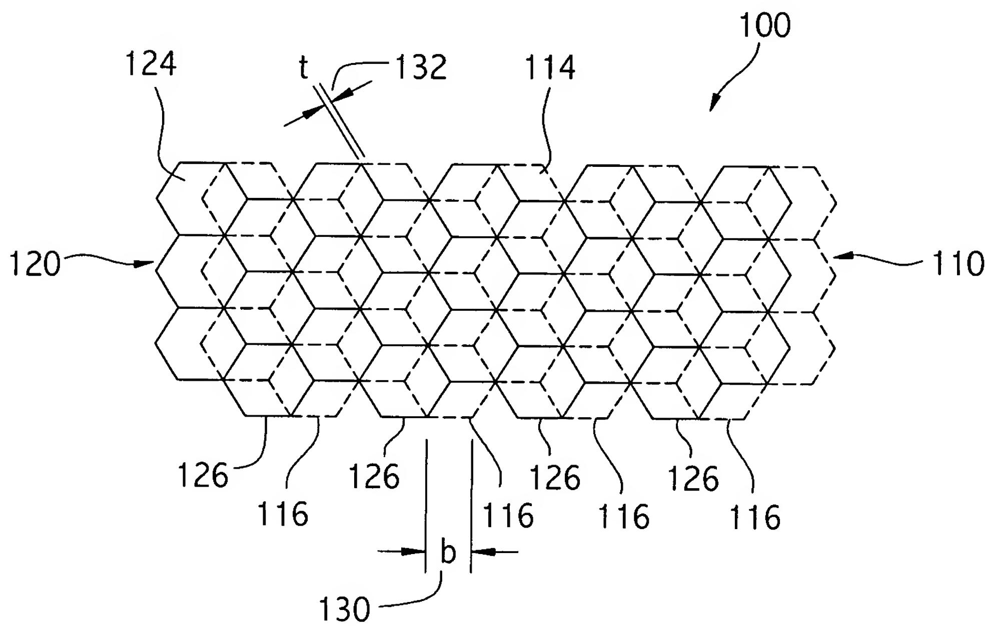

100
124
t
132
114
120
110
126
116
126
116
126
116
126
116
b
130

FIG. 2

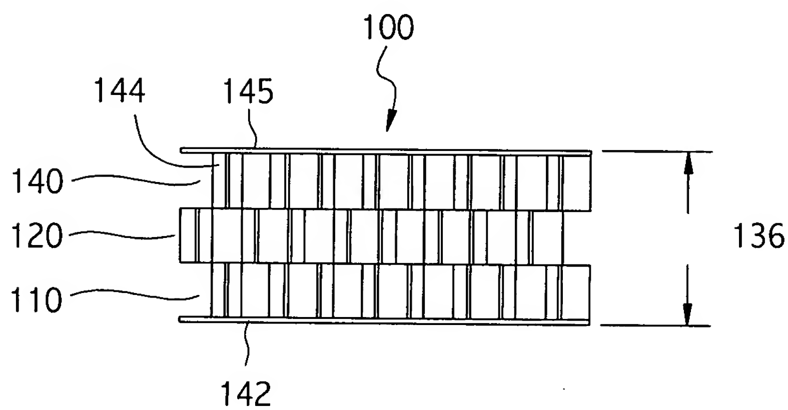


FIG. 3B

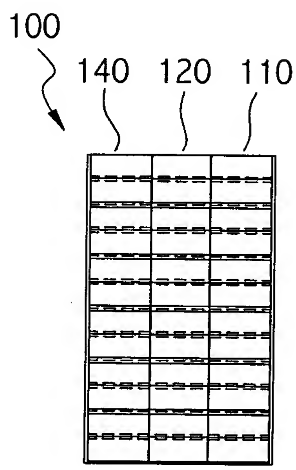


FIG. 3C

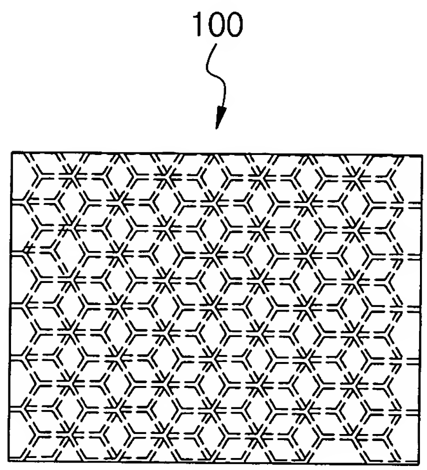


FIG. 3A

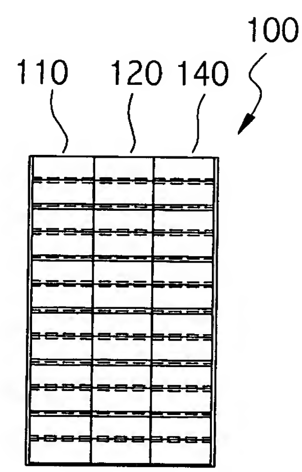


FIG. 3D

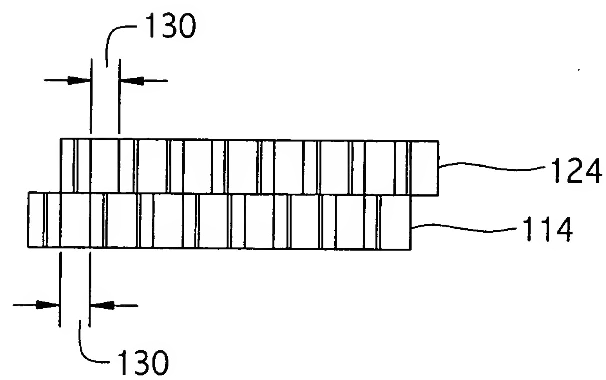


FIG. 4B

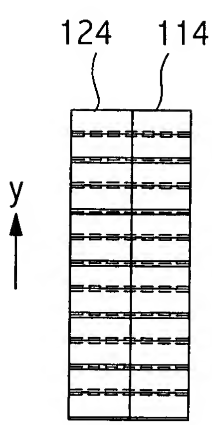


FIG. 4C

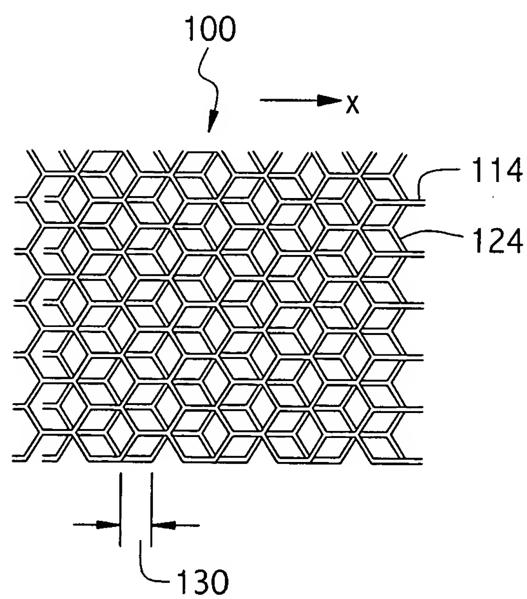


FIG. 4A

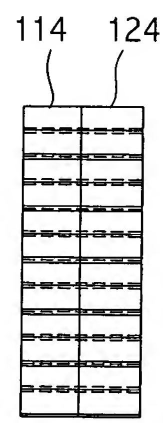


FIG. 4D

FIG. 5B

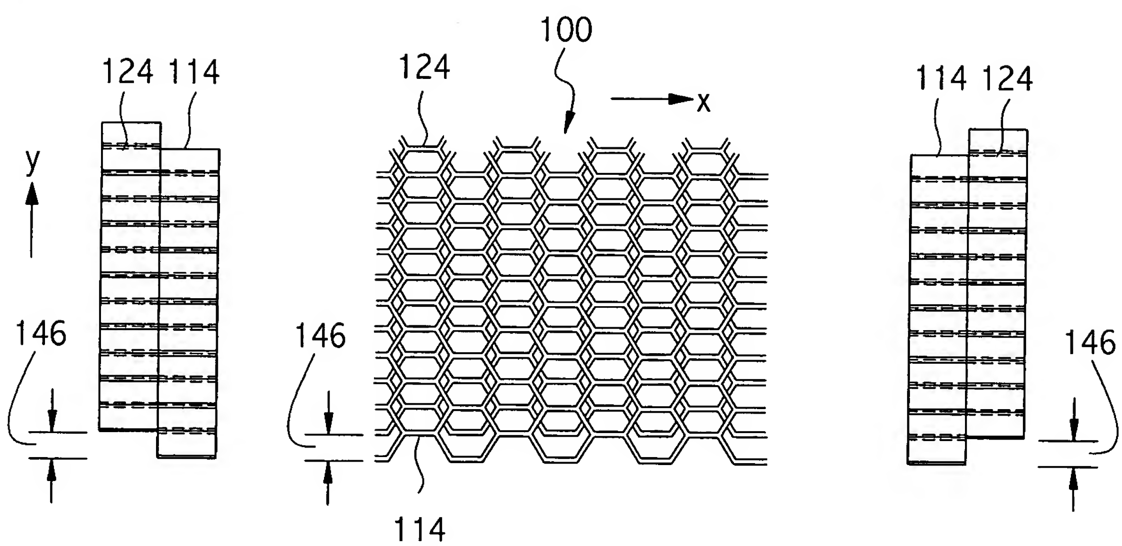
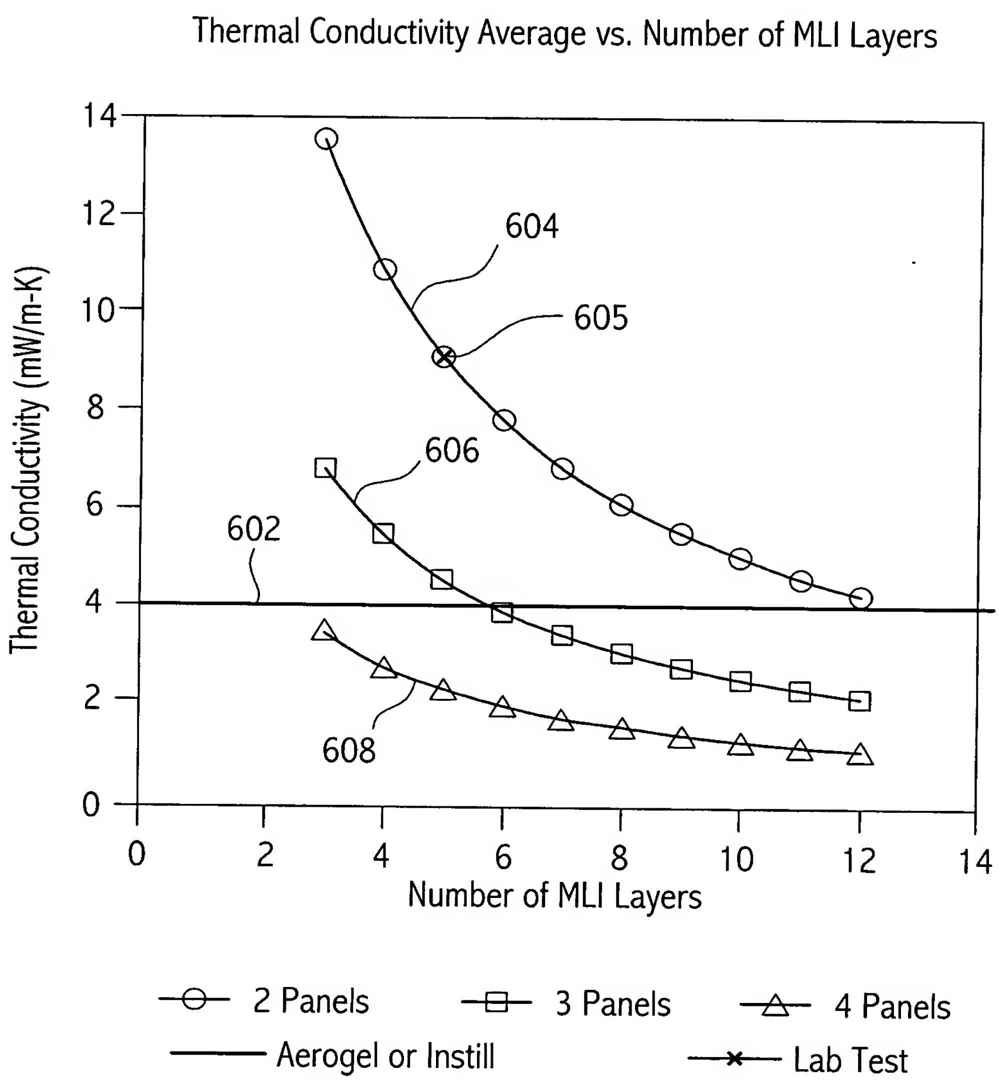
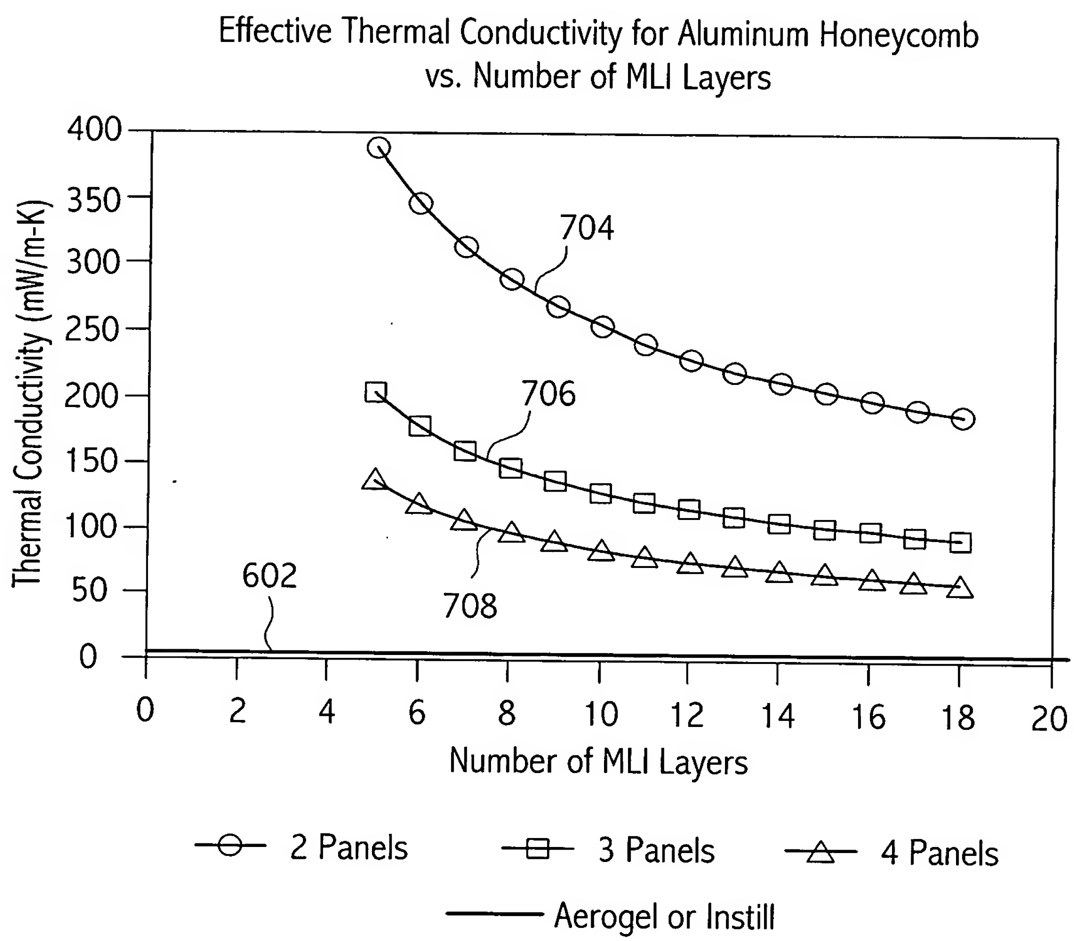


FIG. 5C FIG. 5A FIG. 5D



Effective Thermal Conductivity of Nomex Honeycomb Panels with Multilayer Insulation, Compared to Aerogel or Instill and to a Vacuum Test

FIG. 6



Effective Thermal Conductivity of Aluminum Honeycomb Panels with Multilayer Insulation, Compared to Aerogel or Instill

FIG. 7

FIG. 8

COMPARISON OF HEAT TRANSFER RATES FOR VARIOUS HONEYCOMB CELL CONDITIONS 800

Configuration (802)	Wall Heat Transfer (804)	Air Heat Transfer (806)	Radiation Heat Transfer (808)	Total (810)	Effective Thermal Conductivity (812)	
	BTU/ft^2-hr	BTU/ft^2-hr	BTU/ft^2-hr	BTU/ft^2-hr	BTU-in/ft^2-hrF	mW/m-K
1" Thick Honeycomb Not Evacuated	3.33	8.1	20.44	31.8	0.662	95.5
1" Thick Honeycomb Evacuated	3.33	approx. 0	20.44	23.77	0.495	71.3
Two 1/2" Thick Honeycomb Cores, Each Vacuum Seated in MLI With 1 Layer MLI in Between (5 total) Emissivity=0.6, Shape Factor=0.35	0.39	approx. 0	1.58 (0.35/0.5)(0.6/0.9)(1/(5+1)20.44	1.98	0.04125	5.94
Two 1/2" Thick Honeycomb Cores, Each Vacuum Seated in MLI With 1 Layer MLI in Between (5 total) Emissivity=0.9, Shape Factor=0.5	0.39	approx. 0	3.4067 (1/(5+1)20.44	3.797	0.079	11.38
Three 1/2" Thick Honeycomb Cores, Each Vacuum Seated in MLI With 1 Layer MLI in Between (8 total) Emissivity=0.3, Shape Factor=0.2	0.208	approx. 0	0.303 (0.2/0.5)(0.3/0.9)(1/(8+1)20.44	0.511	0.000895	1.52

Note: Cell wall width = 0.5, Wall Thickness = 0.05, Thermal Conductivity of Cell Material = 0.05 BTU/ft^2-hr. Shape factor is 0.5 for a single cell, 0.35 for two offset cells, and 0.2 for three offset cells. Emissivity is estimated to be 0.9 for the face sheet material and cell. Alternatively, when vacuum sealed in MLI, emissivity is estimated to be 0.6 for an improved face sheet material for two cores, and 0.3 for three cores.